SPECIAL REPORT: What's It All About, Alpha? *page 82*

A CAHNERS PUBLICATION

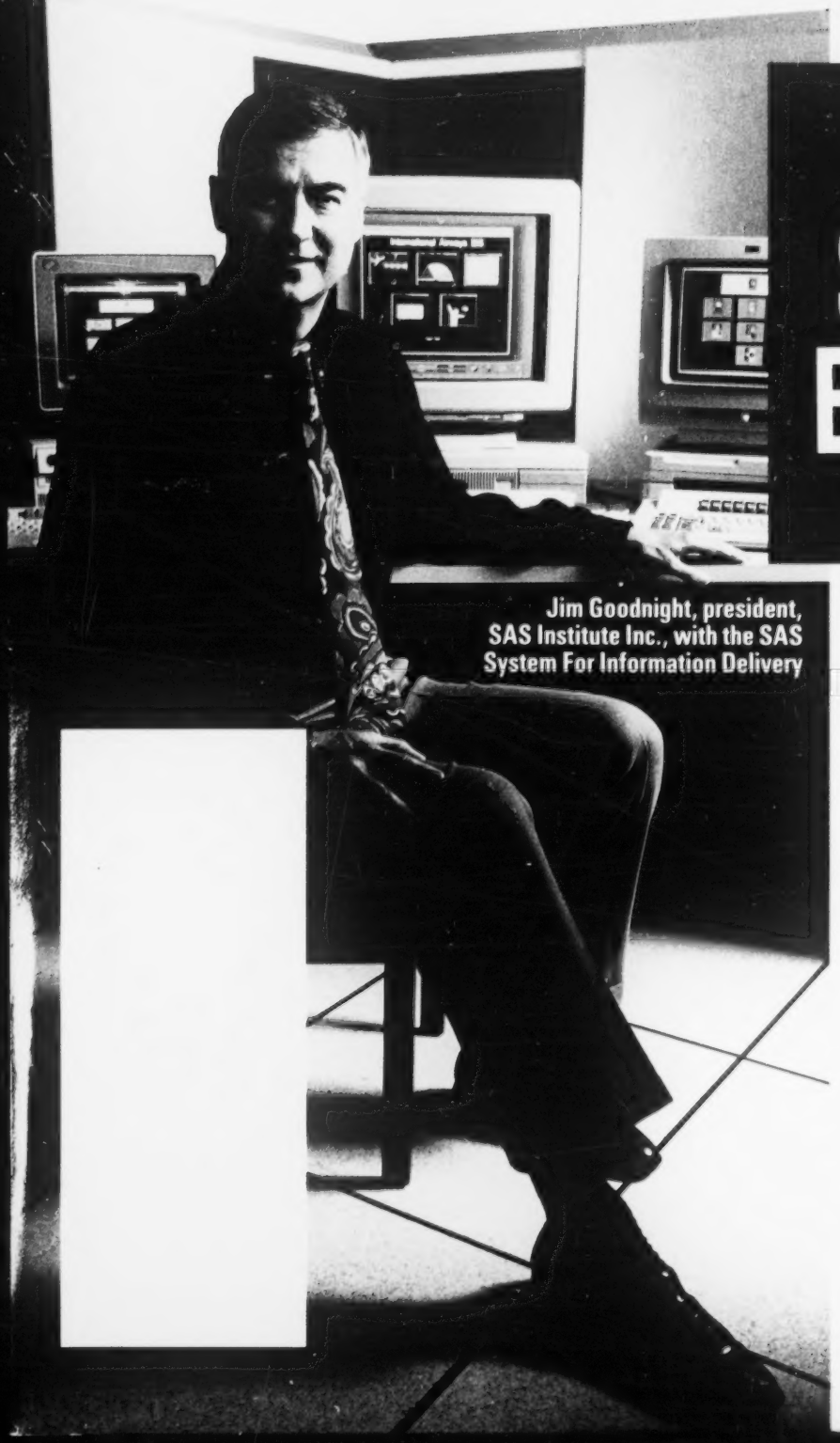
DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

MAY 1, 1992

Can SAS Serve The Enterprise?

page 28



Jim Goodnight, president, SAS Institute Inc., with the SAS System For Information Delivery

The Feud Over Windows Families *page 57*

One Last Chance For ISDN *page 65*

Industrial Strength UNIX Management Tools *page 71*

How To Avoid The Pitfalls Of Downsizing *page 77*

EXCLUSIVE THE HOT APPLICATIONS OF 1992

page 34

DATAMATION
FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

FEATURES

COVER STORY

28 Can SAS Serve The Enterprise?

SAS has already transformed itself into the software system of choice for hordes of MIS shops. Will the new cooperative-processing version 6.07 convert hordes more?

EXCLUSIVE

34 The Hot Applications Of 1992

Improve operations, improve process, improve efficiency. Networks and related technologies are the tools IS will use, reveals DATAMATION's Budget and Spending Study.

PRODUCT GUIDE

91 Go Figure With A Pen

By the end of this month, Slate Corp. expects to roll out At-Hand, a pen-based spreadsheet that runs under Go Corp.'s PenPoint operating system.

92 A Kinder, Faster Fax/Modem

Intel Corp. has introduced a line of internal fax/modems that mesh the hardware, special software and a new architecture.

BUYER'S GUIDE

94 OS/2 Development Tools, Take 2.0

If you want to develop multithreading, multitasking applications with OS/2 version 2.0, you won't have long to wait.

PCs & WORKSTATIONS

57 The Feud Over Windows Families

Microsoft has one. So does Lotus. But is buying into a company's Windows family always a good bet?

ON THE COVER: SAS's Goodnight displays the SAS System on a variety of platforms, page 28.

PRODUCT GUIDE: Slate's Underkoffler throws away the keyboard, page 91.

PCs & WORKSTATIONS: Get it all with one shot, page 57.

Continued on page 5

CONTENTS

FEATURES

NETWORKS

65 One Last Chance For ISDN

After years of hyperbole and delay, ISDN is back with a much more realistic agenda.

SOFTWARE

71 Industrial Strength UNIX Management Tools

UNIX's one major failing in big data centers: loosey goosey systems controls. But now that's all changing.

77 How To Avoid The Pitfalls Of Downsizing

Forget the utopian hype. Downsizing from mainframes to workstations is a tough job. But these basic principles can make it work.

SPECIAL REPORT

82 What's It All About, Alpha?

Digital is courting VMS users with tantalizing glimpses of Alpha, its upcoming 64-bit RISC family. But will Digital move fast enough to reclaim wavering users?

Catholic University's Hassler looks forward to Alpha as the next migration path.

MANAGEMENT

108 CASE Use Is Growing, But In Surprising Ways

Most mature IS organizations still just use CASE tools to help with administrative dirty work and not for full-blown application design.

INTERNATIONAL: Special supplement, not included in all issues, page 88-5.

DEPARTMENTS

Inside 9
Letters 12
Look Ahead 17
Media Report 23
New Products 100
Career Opportunities . . 104
Ad Index 107
Management 110
Future Vision 112

Company Index

Aerojet General 57
Alisa Systems 100
Amoco 71
Applied Digital 100
Archetype 100
Ask 94
ASP Computer 100
AT&T 65
Austin Computer 100
Avatar 100
Avon Products 34
Bachman 77, 94
Bank of Boston 34
Bell Atlantic 65
Bell Communications 65
Borland 94
BRG 34
Business Technologies 94
CA 28, 71, 94
Cadre 94
Cambex 100
Candle 100
Canyon Software 94
Caseworks 94
Catholic U 82
Cayman Systems 100
Chevron 71
Cincom Systems 100
Cisco Systems 65
Citix Systems 100
Compaq 100
Computervision 100
Concord Communications 100
Convex 82
Corporate Software 57
Cray Research 82
Creative Systems 94
DEC 28, 82
DECUS 82
Dell 100
Dharma Systems 100
Digitalk 94
DoD 82
E-Systems 71
Edify 100
Enable Software 100
Enfin Software 94
Ernst & Young 34
Evergreen 100
Extended Systems 100
Faxon 82
First Data 57
Fleet 116
Flexiware 100
Fortis Development 94
Fujitsu Network Switching 65
Go Corp 91
Gold Disk 100
Grumman 34
Gupta 94
Harmon Contract 57
Helene Curtis 34
Hitachi 82
HP 71, 82, 100
IBM 65, 77, 28, 82, 94, 100
IDC 71, 82
IMRS 100
Information Builders 94
Intek 100
Intel 91, 100
Intelligent Environments 94
JCC 82
Jefferson-Pilot 28
JetForm 100
JPI TopSpeed 94
Jupiter Systems 100
KnowledgeWare 77
Kubota 82
Legacy Storage 100
Lotus 57
Maspar Computer 100
Micro Computer 100
Micro Data Base 94
Micro Focus 94
Microsoft 28, 57, 94
Minitab 100
Mips 34, 82
MIT 71
Momentum 94
National Semiconductor 57
Netron 100
Neuron Data 94
Newer Technology 100
Northern Telecom 65
Northwest Airlines 28
Novell 100
NYNEX 65
Objective Solutions 94
On Point 57
Ontos 94
Oracle 28, 94, 100
OSF 71
Peerlogic 94
Pencom Software 100
Performance Computing 77
Pier 1 Imports 34
Premark 57
Prime Computer 28
Progress 100
ProtoView 100
Republic Airlines 28
Samsung 82
Santos 100
SAS Institute 28
Schindler Elevator 65
Sequoia Systems 82
Siemens 65
Slate 91
Software AG 28, 94
Software Clearing House 71
Software Interfaces 82
Software Publishing 57
Southwestern Bell 65
Sun 34, 71, 82
Sybase 94
Symantec 94
Systems Center 71
Tallgrass 100
Tandy 100
Tangram Systems 100
Technojock 100
Tecmar 100
Tektronix 100
TI 77
Tivoli Systems 71
Touchstone Software 100
UBS Securities 82
Unisys 100
UNIX International 71
UNIX System Labs 71
U.S. Bancorp 65
Vertical Systems 65
Viasoft 94
Visible Systems 100
Watcom 94
Within Technologies 94
WordPerfect 57
Wyse Technology 100
XTree 100

Application Development
Admissions Processing
Accounts Payable / Receivable • Billing • Budget Planning • Cost Accounting
Customer Reservation System
Office Automation
Voice Response • Order Entry • Sales Analysis • Network Administration
Risk Assessment
Job Estimating
Archival Records Management
Portfolio Accounting
Credit Checking
Fax Mail • Electronic Mail • Desktop Publishing • Waste Management • EDI • Payroll
Fraud Detection • Trade Reporting • Staffing
On-Line Services • Wholesale Distribution
Clinical Decision Support
Records Management • Insurance Processing • Patient Care

EXCLUSIVE
BUDGET SPENDING SURVEY

Improve operations, improve process, improve efficiency. Networks and related technologies are the tools IS will use, reveals DATAMATION's Budget and Spending Study.

The Hot Applications Of 1992

The most prized application of information technology in 1992 isn't some whiz-bang knowledge-based trading system that outscores Wall Street wizards or a lightning fast COBOL code generator or a breath-taking voice-recognition program. Instead, this year's blue ribbon for the best in technology investments will be wrapped around something a little less glamorous. The still chilly economic climate—brought on by the lingering effects of the recession, sharply declining armaments spending by the Department of Defense and heightened global competition—has forced IS managers and their supervisors to focus their technology spending more tightly on projects that will reduce their organizations' overall costs.

Technologies and products that better manage existing hardware, software and networks, ordered by many veteran IS leaders who remember how to successfully bring order out of computing chaos, are the top development and spending priorities this year. "Networks have become a major bottleneck in our bank," contends one head of IS. Incompatible networks developed by once independent business units plague the corporate-computing landscape, and IS managers have been given the chore of cleaning up the mess. "We are an organization in transition, from a relatively dispersed and distributed transaction-oriented system to a more integrated, client/server model," adds Michael Simmons, executive vice president for operations and systems at The First National Bank of Boston Corp.

As IS managers try to bring order to the undisciplined departmental systems cobbled together in the late 1980s, they will do so with only a modest increase in resources. This year's budget study shows a 4.0% average budget increase, up only six-tenths of a percentage point from last year. But the survey reveals a broad range of spending across various sectors. Health care institutions will increase spending by 8.6% this year, and retailing is up by 6.1%. IS budget increases for financial services firms, transportation companies, government IS departments and other sectors will barely cover the expected 3% inflation rate, if that. Indeed, many IS shops report budget cuts this year or at best expect that

The Most Popular Applications In 1992

LAN Management	**30%***
Electronic Mail	**27**
Office Automation	**24**
Records Management	**23**
Financial Reporting	**22**

*The % of respondents reporting the use of each application at their sites.

Source: DATAMATION/BRG

BY LARRY MARION

spending will remain at 1991's level. "Our 1991 to 1992 budget is flat, after the budget had declined by 17% from 1990 to 1991," says Bank of Boston's Simmons.

To determine how IS departments are coping under the unprecedented economic pressures, DATAMATION and the Business Research Group (BRG), a sister organization of the magazine also based in Newton, Mass., late last year contacted more than 17,000 managers in a landmark study of U.S. organizations' 1992 IS budgets and application-development plans. More than 1,700 returned detailed questionnaires. In addition, about 100 IS managers interpreted and explained the data under condition that their identities not be revealed. This is DATAMATION's first survey of the applications development plans and decisions of a large number of sites on a sector-by-sector basis. (Detailed reports on 10 key sectors begin on page 40.)

The Most Popular Technologies In 1992

Local Area Networks	**46%***
Client/Server Architecture	**43**
GUIs/Windowing	**37**
Bar Code Processing	**35**
Relational Databases	**33**

*The % of respondents reporting use of each technology at their sites

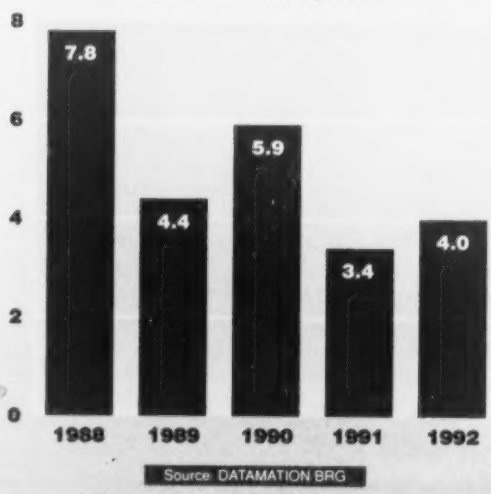
Source: DATAMATION/BRG

Cost management was a very important or the most critical goal of more than 90% of survey respondents this year. Less than a third of them said that improving the quality of their companies' products and services was a critical goal of IT in 1992, despite all the media hype about the new devotion to quality. "The whole goal of the company is to survive," says the IS chief at a company dependent on weapons contracts from the DoD. "So the IS budget is down 10%. We're just treading water."

The key IS life-preserving strategy for keeping corporations, government agencies, hospitals and other organizations afloat in 1992 is to get better control of and more computing efficiency from existing networks through network management, client/server and e-mail applications.

Lean Times For IS Budgets

% Annual Increase In Spending For Information Systems



Source: DATAMATION BRG

Overall spending on networking products is up more than 5% this year from last, a higher growth rate than for other budget categories such as hardware (4.4%) or software (4.2%). About 46% of the respondents said that they are working with LANs this year, the highest percentage for any one technology; 43% of all respondents are incorporating a client/server architecture on the LAN. The growth in the number and size of LANs beginning in the late 1980s has enabled many organizations to take advantage of these networks to downsize applications from mainframes to PC servers, IS managers say.

"The client/server architecture will be used for new applications plus for rehosting existing corporate apps as a strategy to reduce IS costs," says the head of MIS for an aerospace company. Replacing a remote data center with a LAN-based client/server system has an important political as well as cost benefit—departments facing the prospect of losing their data center can be placated by the physical presence of the server. "Divisions and sectors that lost data centers through consolidation will be expanding client/server installations in a desire to retain control," the MIS head suggests.

Managing a heterogeneous network environment containing multiple LANs and servers is a significant challenge and administration burden for IS, so the push to install LAN management systems is strong. Network administration is the top applications priority of 30% of the IS officials surveyed. Electronic mail is the second most popular application this year, as LANs evolve into a vital utility, the spinal cord of the organization. E-mail can enhance information distribution as organizations move to improve efficiency in the wake of the reduction in the number of middle management layers.

Using computer and communications technologies to reduce the cost of processing an order, writing a business plan, evaluating an insurance claim and other office tasks are also high on the IS project list in 1992. About a quarter of the survey respondents reported that office automation and records management were priority applications this year. In addition, some organizations are reengineering their office workflow processes to increase productivity and quality at the same time they're cutting data-processing costs, a neat trick if they can pull it off. Bank of Boston, for example, is pursuing several projects to consolidate check-processing using imaging, according to Simmons.

Electronic data interchange is one of those antipaper applications that lots of companies have talked about but relatively few have chosen to adopt—until recently. The need to cut the cost of handling purchase orders, invoices and other business documents, reduce time to market and better match customer demand to supply have created a critical mass of EDI proponents in key industries like consumer products and retailing. About 24% of the respondents said they will develop EDI systems this year, including about

half of the retail and wholesale companies and their food, clothing and beverage suppliers.

In fact, the importance of technology for retailers engaged in their perennial struggle for market share is clearly seen in this year's 6.1% spending increase in this sector. EDI, advanced point of sale (POS) systems and other technologies are seen as crucial to the continued financial well-being of retailers and wholesalers. The IS budget at Pier 1 Imports in Fort Worth, for example, is up 20% this year, in part due to a new POS system, says data center director Robert O'Neill.

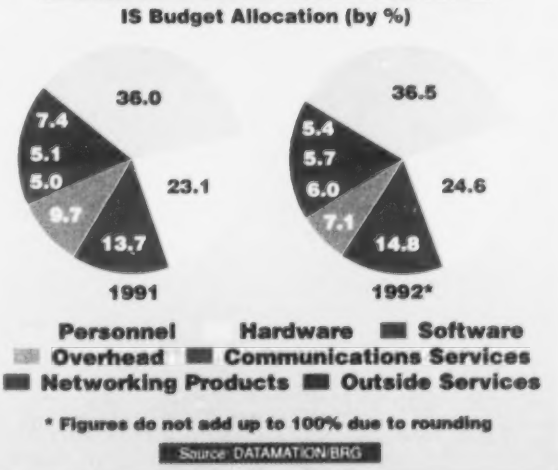
"Customers like Wal-Mart are a lot more sophisticated, and the importance of technology is much more so now than it was five years ago. And it will be even more important in five years," adds Lewis Duberman, vice president and chief financial officer of Chicago-based cosmetics maker Helene Curtis Inc., which has upgraded its EDI capabilities at the behest of customers. "If a company doesn't invest in technology, it will fall by the wayside," Duberman asserts.

Applications like EDI, office automation and records management depend on specific enabling technologies. And of those technologies, only proven hardware and software will be in demand this year, not bleeding edge, blue-sky dreams. A high priority among the enabling technologies are software and supporting hardware to provide a graphical user interface and windowing capability to make PCs, workstations and advanced terminals easier to use. About 37% of the respondents will be buying GUI software this year, many probably anticipating the revised version of Windows from Microsoft.

While a snazzy GUI looks inviting, users won't have much interest in it if the data they need are not accessible. Relational database management software is crucial for organizations needing to glean the most insight from the data housed in mainframes and network servers, and about 33% of the survey respondents are implementing a new or enhanced RDBMS in 1992. Governments at the local state and federal level will be among the big advocates of RDBMS technology this year—43% of the government offices said that the technology is on their project list for 1992. Some government IS officials say their RDBMS development work this year will focus on consolidating applications on fewer software platforms. Others say they will use RDBMSs to upgrade existing flat file systems or for entirely new applications. One new federal application is designed to keep better track of the government's real estate holdings from failed banks.

Increased use of database and decision-support software has triggered demand for optical disc storage and image-processing systems. About 23% of the respondents indicated that their sites would install an optical disc system this year. Hospitals and medical centers are especially keen on optical storage of patient records—31% of the medical IS managers indicated they would develop such an application this year.

Hardware Gets A Bigger Slice Of The IS Budget Pie



Just like last year, IS shops had difficulties preparing a budget to fund these applications in the weak 1992 economic climate. Survey respondents indicated that about 45% of IS departments had to rebudget in 1991, and the same percentage predicts a return to their spreadsheets in 1992. Pier 1's O'Neill says he had to rebudget twice in 1991, and by early March had already done two budgets for 1992. Uncertainty about the economy or other business issues delayed 1992 IS budget approvals at about half the shops until December 1991 or later.

But in the end, after the delays and debates played themselves out, the result was a cut in overhead and on spending for outside services (consultants and contract programmers). That money is being used to fund hardware, software and networking purchases considered critical to applications development. The decline in the number of data centers due to consolidation has eased more IS costs than just software licensing fees—fewer glass houses mean fewer dollars spent on real estate, electricity and other overhead costs. Bank of Boston's Simmons says he's consolidating nine data centers for applications running on Digital minicomputers to two: "Those kind of consolidations generate big savings."

Those savings aren't necessarily coming out of IS staffers' pockets. Contrary to some expectations, the proportion of the overall IS budget devoted to personnel appears relatively stable, at 36% this year. Of course, personnel spending by some companies and in some industries will not be stable—27% of the IS shops responding from aerospace, defense and automotive companies predict a decline in their

Survey Available

The MIS Strategic Planning Study from DATAMATION/BRG includes more than 130 pages of data about the 1992 plans and budgets of 1,750 computer sites. The data rank more than 60 applications and 40 technologies that will be deployed this year by 17 sectors. For more information, contact Nancy Finn at the Business Research Group at (617)-630-3900.

head counts due to those industries' declining fortunes.

And consolidation notwithstanding, hardware and software spending will increase by a significant 1.5 and 1.1 percentage points, respectively, in relation to the total IS budget.

Major hospitals and medical center operators represent the most active developers of mainframe-based applications this year—about 31% of the shops surveyed. Health care institutions are turning to centralized mainframe applications for a combination of reasons—the burgeoning size and number of patient medical records, many of which include electronic images; a desire for more efficient security for patient records; and the need for centralized processing for electronic reimbursement. "If we can't identify what we did, and for whom, and at whose order, we can't get reimbursed," explains the IS director of a for-profit health care corporation.

While the fact that 33% of the respondents said they're working on applications to run on desktop computers is not a surprise, the rise of reduced instruction set computing (RISC) workstations in commercial markets is remarkable. More than 27% of the respondents indicated their shops were developing applications on RISC workstations from Mips Computer Systems Inc., Sun Microsystems Inc. or other vendors. Educational institutions are the leading developers this year—34% are engaged in a RISC-based project. And more than a quarter of the heavy-manufacturing and natural resource companies have also jumped on the workstation bandwagon.

Last year, a number of vendors announced handheld computers amid questions about the utility and functionality of the devices. Despite the dearth of available hardware and software, a startlingly high number of IS managers, more than 10%, report investment in handheld devices. Proprietary designs are popular this year. To speed order entry and other tasks, Avon Products Inc. of New York City, for example, is rolling out a custom-made terminal a little larger than a pack of cigarettes for 20,000 of its door-to-door salespeople this year, according to chief information officer Raymond Perry. The Avon-designed device, built in a Philippine factory supervised by IBM, costs the company less than $100.

Retail-oriented companies won't be the biggest user of handheld computers this year, though—24% of the transportation firms report use of handheld devices. "We're working on a system that would automatically record deliveries, mileage and maintenance information," says the head of IS for a company with a large truck fleet. "The system will improve our efficiency by automating schedule development and monitoring."

Considering all the hype from the media and consultants about outsourcing, the 2 percentage point decline in spending for outside services is somewhat unexpected. However, don't forget that IS managers may be the last to know that part of their budget may be diverted to an outsourcing firm. Dale Wortluft, national director of IS services for Ernst & Young, says that the chief financial or executive officer usually initiates a move to outsourcing. In addition, business unit managers are starting to consider outsourcing when they become disappointed with IS. "We have a request for information right now from a department that is dissatisfied with the applications development area," Wortluft says. "It had poor response times, no priority for the department's projects, things take too long and what was produced was not quality output. We'll see more individual units looking to have something done on the outside."

Wortluft's experience could serve as a warning that the current vogue of concentrating on improving operations could be a long-term disaster for IS officials overly focused on efficiency. IS executives who concentrate narrowly on squeezing more code out of their programmers or generating more uptime from the data center may fall into the same trap that ensnared their predecessors in the late 1970s and early 1980s.

More efficient data center operations should not preclude involvement in the business units. Important new IS-based products and services must be proposed, promoted and produced, or else the technologically savvy business unit managers will preempt those opportunities—just as their spending on PCs, workstations and minicomputers have put more MIPS outside the glass house than in it. IS managers should view the renewed interest in their traditional strengths—efficient data center operations, experience with data security and integrity and other standard IS practices—as an opportunity to demonstrate their ability to think like businesspeople and not just like code runners. ■

Larry Marion, a former assistant managing editor of DATAMATION, is an editor and writer based in Newton, Mass. Research provided by Cahners Publishing Co.'s Business Research Group and Virginia Ewell of the Newton-based market research firm Camden Ltd.

Reports on key industry sectors start on page 40.

How We Did The Survey

Two different seven-page questionnaires—one for service industries, the other for manufacturers—were mailed to more than 17,000 IS managers during December 1991 and January 1992. The managers were selected from DATAMATION's subscriber list and from a database of IS officials supplied by Computer Intelligence of La Jolla, Calif. The recipients were asked to identify their 1992 applications development projects from a list of more than 60 discrete topics. In addition, they were asked to identify which of 44 hardware, software and networking technologies would be used. Approximately 1,750 completed questionnaires were received by late February and sorted into 17 categories. DATAMATION consolidated that information into 10 sectors, presented below.

In addition to the questionnaires, DATAMATION and its sister organization, the Newton, Mass.-based Business Research Group, conducted detailed telephone and in-person interviews with almost 100 top IS officials from various industries to better understand the business dynamics that are driving IS spending priorities.

Sector Benchmarks

Mean IS Budget ($Millions)

1	Communications	17.2
2	Finance	17.0
3	Transportation	14.8
4	Government	11.0
5	Machinery	9.4
6	Education	6.8
7	Natural Resources	6.0
8	Health Care	5.6
9	Retail	5.3
10	Processors	4.3

Communications Services**

1	Transportation	10
2	Communications	8
3	Finance	7
4	Government	7
5	Natural Resources	7
6	Retail	7
7	Machinery	6
8	Education	5
9	Processors	5
10	Health Care	3

Non IS Technology Spending*

1	Education	24
2	Natural Resources	20
3	Government	18
4	Communications	17
5	Machinery	17
6	Processors	17
7	Health Care	16
8	Retail	14
9	Finance	13
10	Transportation	13

Networking Products**

1	Communications	8
2	Government	8
3	Education	6
4	Machinery	6
5	Natural Resources	6
6	Transportation	6
7	Finance	5
8	Health Care	5
9	Processors	5
10	Retail	4

Mean Head Count

1	Communications	295
2	Transportation	212
3	Finance	206
4	Government	189
5	Machinery	110
6	Health Care	76
7	Education	61
8	Natural Resources	37
9	Processors	36
10	Retail	36

Personnel**

1	Education	44
2	Government	38
3	Finance	37
4	Health Care	37
5	Processors	37
6	Natural Resources	35
7	Retail	35
8	Machinery	33
9	Transportation	33
10	Communications	31

Hardware**

1	Retail	28
2	Communications	26
3	Health Care	25
4	Machinery	25
5	Transportation	25
6	Processors	24
7	Finance	24
8	Natural Resources	23
9	Education	22
10	Government	21

Overhead**

1	Machinery	9
2	Processors	8
3	Retail	8
4	Communications	7
5	Finance	7
6	Natural Resources	7
7	Education	6
8	Government	6
9	Health Care	6
10	Transportation	5

Software**

1	Health Care	19
2	Communications	16
3	Finance	16
4	Natural Resources	16
5	Machinery	15
6	Processors	15
7	Transportation	15
8	Education	13
9	Government	13
10	Retail	13

Outside Services**

1	Government	7
2	Processors	7
3	Machinery	6
4	Natural Resources	6
5	Transportation	6
6	Communications	5
7	Health Care	5
8	Retail	5
9	Finance	4
10	Education	3

* Percentage of the IS budget spent on hardware and software by non IS departments
** Percentage of total IS budget

Source: DATAMATION/BRG

EXCLUSIVE

BUDGET/SPENDING SURVEY

PROCESSORS:

The Big Squeeze

APPLICATIONS

Competition in the commodity segments that dominate the chemical, food, beverage and tobacco industries drives participants to focus on achieving low-cost producer status. Consequently, IS managers are continually pressed to deliver more precise and comprehensive tools to enable executives to shave costs. "Chemical companies are becoming more globally efficient in every way, including design, production, marketing, sales, delivery and support," explains the MIS chief for a chemical producer.

THE HOT APPLICATIONS

- **Records Management**
- **EDI**
- **Inventory Planning**
- **Cost Accounting**
- **Electronic Mail**

Electronic data interchange, records management, inventory-planning and cost-accounting systems are high priorities. Many chemical firms have developed just-in-time systems as well. Sensors in customer storage bins linked to suppliers via a wireless network are replacing traditional order entry. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
$4.3 ($Millions)	3.3% From 1991	17% (As % Of IS Budget)	36 Average	0.9% From 1991

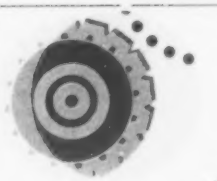
TECHNOLOGIES

Keeping better track of material, deliveries, containers and transport equipment is vital to the efficient operation of a chemical or food processor, and bar code readers will become ubiquitous this year to close the network loop. Consequently, large chemical and food companies must enhance the performance of their LANs with higher speeds. "We're installing links between our mainframe and our customers' computers, part of an effort to improve support and be a partner with our customers," says the vice president of MIS for a major food processor.

THE HOT TECHNOLOGIES

- **Bar Code Processing**
- **LANs**
- **Client/Server Architecture**
- **GUIs/Windowing**
- **RDBMSs**

Sales and marketing departments need relational databases loaded onto local servers to keep up with the regional nature of their food-processing industry. End users insist on applications accessed through graphical user interfaces and windows. ■



EXCLUSIVE

BUDGET SPENDING SURVEY

MACHINERY:

Tools For Tracking

APPLICATIONS

THE HOT APPLICATIONS

- Records Management
- EDI
- Electronic Mail
- Cost Accounting
- Network Administration

Many equipment and component manufacturers view patent-licensing fees as an important source of revenue. So, for both offensive and defensive reasons, systems that track intellectual property assets and facilitate patent protection are high on the application lists of the makers of electrical and electronic equipment, motor vehicles and aircraft this year. "The Japanese have invested heavily in systems that track and monitor U.S. patents, with a strategy of bracketing [circumventing] existing patents," says the MIS head of a major electronics company.

Electronic mail and other network-based management software are also being developed at companies replacing middle management with self-managed teams. EDI in such companies is viewed as a combination cost-cutter, efficiency booster and quality enhancer. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count %Change
$9.4 ($Millions)	3.4% From 1991	17% (As % Of IS Budget)	110 Average	-0.4% From 1991

TECHNOLOGIES

THE HOT TECHNOLOGIES

- Client/Server Architecture
- LANs
- Bar Code Processing
- RDBMSs
- GUIs/Windowing

Hard-pressed aerospace companies and vehicle makers view client/server computing on local area networks as part of their push to reengineer design and production. And fewer but larger data centers supporting product teams appear to be more efficient and cost effective than the mainframe- and minicomputer-based distributed data-processing concept of the past. "It's part of a retrenchment strategy for IS because senior management wants to reduce its capital investment in computers," says one aerospace company IS official.

Bar code readers will continue to be popular in the auto industry and in aerospace companies. Better materials tracking enhances the effectiveness of ma-nufacturing resource planning (MRP) systems. GUIs and Windows ease training of shop-floor employees using these systems. ■

EXCLUSIVE
BUDGET/SPENDING SURVEY

GOVERNMENT:

Networks Win Votes

APPLICATIONS

Local area network-based applications that reduce the cost of operating data centers and end-user departmental systems have helped government IS managers conform to political mandates to control spending. The mean budget change for 1992 was a 1% increase. As in other sectors, the need for network management software to ease the operator burden is the top priority of government IS officials in 1992. The spread of departmental LANs has led to demands for electronic mail. Updated budget and personnel systems are being built with new database software.

California is reducing its computer costs by replacing older database packages with a smaller number of newer programs. However, warns Bill Knox, large systems support branch manager at California's data center in Sacramento, "The conversion costs are not trivial." ■

THE HOT APPLICATIONS

- **Network Administration**
- **Office Automation**
- **Budgeting**
- **Electronic Mail**
- **Personnel Management**

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
$11 ($Millions)	1.0% From 1991	18% (As % Of IS Budget)	189 Average	-0.1% From 1991

TECHNOLOGIES

IS shops in government agencies love LAN technology—the server and other hardware becomes turf they can call their own when management looks to eliminate "their" data centers. Agency heads hope maintenance and overhead of LAN operations will be lower than they have been for mainframe data centers. They're hoping, but they're not sure. "We're off-loading applications from the mainframe to networked PCs, but we've been only marginally successful so far," Knox says.

Many government agencies are reducing the number of approved hardware and software products in a given category to cut their support costs. But the need to improve productivity by making computing easier has stoked demand for a graphical user interface and windowing software—49% of government sites report a GUI/Windowing project this year. ■

THE HOT TECHNOLOGIES

- **LANs**
- **Client/Server Architecture**
- **GUIs/Windowing**
- **RDBMSs**
- **Desktop Computers**

EXCLUSIVE

BUDGET/SPENDING SURVEY

FINANCE:

Bouncing Checks

APPLICATIONS

THE HOT APPLICATIONS

- **Network Administration**
- **Financial Reporting**
- **Claims Processing**
- **Office Automation**
- **Loan Processing**

Development of expert systems to review insurance forms and other glitzy applications are out at the IS departments of most banks, securities firms, insurance companies or diversified financial institutions in 1992. This year, IS officials in the financial-services industry are developing applications that will reduce their mainframe costs, eliminate employees and provide closer scrutiny over bad loans, claims and securities.

Hundreds of local area networks have blossomed as financial institutions downsize mainframe-based applications. So, as in most sectors, IS managers face an ever more daunting task of network management. Banks are also keen to develop automated loan-processing systems, which improve service, reduce personnel and processing costs and provide closer portfolio scrutiny for top executives and regulators. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
$17.0 ($Millions)	2.6% From 1991	13% (As % Of IS Budget)	206 Average	0.2% From 1991

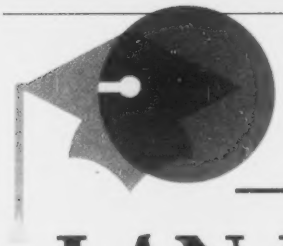
TECHNOLOGIES

THE HOT TECHNOLOGIES

- **Client/Server Architecture**
- **LANs**
- **GUIs/Windowing**
- **Image Processing**
- **Desktop Computers**

Topping financial IS managers' shopping lists this year are network servers and software for client/server computing. The LANs and servers are replacing a multitude of incompatible departmental data centers with a more streamlined and homogeneous computing resource.

Image processing has become routine at many financial organizations, as the cost of the technology declines and the cost of processing checks and other paper instruments climbs. Several banks, such as the Bank of Boston, are developing image-processing applications that seek to capture not only the image of a check but the data on it. With such a system, these banks hope to replace the expensive process of returning checks to their customers with single-page images of those checks, and reduce some of the work involved in automated check processing. ■



EXCLUSIVE

BUDGET/SPENDING SURVEY

EDUCATION:

LAN Lessons Learned

APPLICATIONS

THE HOT APPLICATIONS

- **Network Administration**
- **Electronic Mail**
- **Personnel Management**
- **Budget Planning/Tracking**
- **Accounts Receivable**

As personal computers become ubiquitous in the college student dorms and apartments, IS administrators are facing a geometrically increasing network burden. Local area network management chores have become extreme due to the mix of node technologies: Macintoshes and IBM PCs in the dorms; reduced instruction set computing workstations in the physics labs; minicomputers and mainframes in the data centers.

Zero budget growth in the wake of cuts in state aid has forced many universities to substitute software for labor to automate operations, maintenance, training and development, IS managers say. Data are being entered via telephone or remote PCs rather than paper forms. Several colleges are revamping their legacy systems, such as accounts receivable, from batch to real-time processing. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
$6.8 ($Millions)	0.0% From 1991	24% (As % Of IS Budget)	61 Average	-0.1% From 1991

TECHNOLOGIES

THE HOT TECHNOLOGIES

- **RISC Workstations**
- **Fiber-Optics**
- **LANs**
- **Client/Server Architecture**
- **GUIs/Windowing**

Speedy RISC workstations have been taking college labs by storm over the past five years, and that wave will continue to swell in 1992—53% of the IS managers in education responding to the survey expect to buy RISC-based workstations this year. Considering the growth of the workstation population and demand for electronic mail, it shouldn't come as a surprise that 49% of the schools are adopting fiber-optics as their primary networking medium. It is cost effective to link their buildings into campus-wide networks.

Improving the quality of IS services for faculty, administration and students is the rationale behind the interest in graphical user interfaces and windowing. Many university IS departments see GUI front ends as a way to attract and keep students and faculty who need smooth and easy access to text databases. ■

EXCLUSIVE

BUDGET/SPENDING SURVEY

RETAIL:

A Tighter Fit

APPLICATIONS

THE HOT APPLICATIONS

- **EDI**
- **Inventory Planning**
- **Purchase Order Processing**
- **Electronic Mail**
- **EIS**

The pressure on retailers to reduce their time to market and their transaction costs has launched a mad scramble to develop electronic data interchange systems this year. About half of the retailers surveyed say they're working on them. Other applications related to optimizing sales, such as inventory-planning and purchase-order-processing systems, are also high priorities this year, explains the head of MIS for a major retailing chain. Optimized store inventory systems will eliminate the need for warehouses.

Top officials of the retailing giants pride themselves on being attuned to market conditions, and faster access to detailed sales and inventory data on a real-time basis via executive information systems is considered essential. An EIS, coupled with the networks and inventory software, can "guarantee consistent pricing across stores," says an IS official. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
$5.3 ($Millions)	6.1% From 1991	14% (As % Of IS Budget)	36 Average	1.5% From 1991

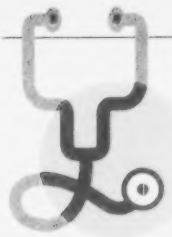
TECHNOLOGIES

THE HOT TECHNOLOGIES

- **Bar Code Processors**
- **LANs**
- **Client/Server Architecture**
- **Desktop Computers**
- **Minicomputers**

Fast and accurate translation of the universal product codes printed on cans, boxes and other packages is the top priority of retailers and wholesalers. In addition to new generations of supermarket scanners, IS managers say, handheld units with wireless links to the CPU are being incorporated into inventory management systems this year. "In 1992, the big applications will focus on reducing the cost of moving and processing inventory," says the head of MIS for a major retailer.

Several retailers have led the industry in cutting costs and improving customer service by using both local- and wide-area networks, and their competitors and suppliers are being forced to follow suit. "If a company doesn't invest in technology, it will fall by the wayside," laments a supplier about to connect his computers to a retailer. ■



EXCLUSIVE
BUDGET/SPENDING SURVEY

HEALTH CARE:

Record Systems Cured

APPLICATIONS

THE HOT APPLICATIONS

- **Physicians Link**
- **Records Management**
- **Clinical Decision Support**
- **Patient Care**
- **Radiology**

Real-time patient record systems under development this year will improve the productivity of physicians and their support staff. Doctors will be able to review records from their offices rather than having to go to the hospital. Also, automated record-keeping systems will help reduce physicians' paperwork: "Point-of-care terminals will be used to replace handwritten patient charts," predicts the IS chief at a major medical center.

The explosion in medical testing has ballooned the data-storage requirements of hospitals and physicians' offices. The need to streamline records administration and receive prompt reimbursement from third-party payers has propelled record-management systems to a high priority. In addition to medical records, images from CAT scanners and other devices are being stored electronically. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
$5.6 ($Millions)	8.6% From 1991	16% (As % Of IS Budget)	76 Average	3.1% From 1991

TECHNOLOGIES

THE HOT TECHNOLOGIES

- **LANs**
- **Bar Code Processing**
- **Fiber-Optics**
- **Desktop Systems**
- **Optical Discs**

Electronic patient record systems require robust networks running throughout the hospital complex. The need for complete and accurate reimbursement has led many health-care providers to use bar code scanners to track the use of syringes, drugs and other paraphernalia. "The expanding centralized hospital system requires integrating LAN-based systems and remote locations with the mainframe through the use of bridges and wide area networks," says a medical center MIS director.

The need to transmit graphics-laden medical records to specialists over networks is pushing many medical centers to use fiber-optic cables. A heavier graphics load is also fueling the use of optical discs for long-term storage. "Imaging for medical records is definitely happening," affirms an IS official. ■

EXCLUSIVE

BUDGET/SPENDING SURVEY

COMMUNICATIONS:

System Calls Soar

APPLICATIONS

Faulty or inflexible billing systems have been the bête noire of major communications vendors. As competition intensifies, vendors are redoubling their efforts to develop the tools to offer more customized bills to commercial customers. Competition is also pressuring profit margins, and communications firms need new financial-reporting systems to more closely monitor their financial performance. Executive information systems are being used to monitor operations and to develop new products and services.

THE HOT APPLICATIONS

- **Billing**
- **Financial Reporting**
- **Office Automation**
- **Electronic Mail**
- **EIS**

An increased use of electronic mail for internal communications allows communications companies to reduce levels of management, another priority of cost-conscious firms. "Since the network is our business, it behooves us to use it as extensively as possible," says the chief information officer of a major communications services vendor. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
$17.2 ($Millions)	3.2% From 1991	17% (As % Of IS Budget)	295 Average	0.4% From 1991

TECHNOLOGIES

Communications companies are major adopters of the client/server architecture using local area networks, as their IS organizations evolve into a combination of centralized services and decentralized support. "Certain applications are more appropriately centralized to achieve economies of scale among a group of business units, while other applications are more appropriately decentralized if they only are used by one unit," notes a CIO.

THE HOT TECHNOLOGIES

- **Client/Server Architecture**
- **LANs**
- **GUIs/Windowing**
- **Laptops**
- **RDBMSs**

The head of MIS reports that no new mainframe applications are being developed by his shop. However, he needs better CASE tools to build distributed applications on a network.

Laptops are popular among executives, as well as the field sales forces, for remote access to the e-mail networks. Relational database management systems are used as marketing tools to identify potential customers for new services. ■

EXCLUSIVE
BUDGET/SPENDING SURVEY

TRANSPORTATION:

Cheap Moves Ahead

A weak economy and a static market for transportation services demands ever more efficient operations, and IS managers at airline, trucking, railroad and shipping concerns are upgrading existing systems to keep their firms competitive. Enhancing internal and external communications via electronic mail is a key project at many transportation company IS shops this year. Desktop publishing is vital for the industry to produce up-to-date schedules and rates. Optimal use of assets like trucks and buses has made scheduling and maintenance applications high priorities this year, IS managers report. "Our strategic push is moving from basic accounting operations into logistics," notes the head of IS at a major trucking firm. Human resource management systems are being used as the platform for training crews and salespeople. ■

THE HOT APPLICATIONS

- **Electronic Mail**
- **Publications**
- **Trip Scheduling**
- **Maintenance Tracking**
- **Personnel Management**

APPLICATIONS

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
$14.8 ($Millions)	1.6% From 1991	13% (As % Of IS Budget)	212 Average	2.6% From 1991

TECHNOLOGIES

Several technologies are being used to tie field workers at a dock, freight yard or airport into networks linking regional operations and headquarters. Portable computers, sometimes with cellular modems, are being used by some companies to provide real-time shipment data to the enterprise and to customers. Seeking applications portability and interoperability, transportation IS managers are increasingly basing these networks on minicomputers running UNIX. They're porting mainframe-based applications over to minis as servers for the LAN to provide lower cost distributed processing. They're upgrading EDI systems to handle more complex transactions. "While EDI is not new for this industry, its use is being expanded to include more suppliers, smaller customers and global operations," says the IS director of a major freight company. ■

THE HOT TECHNOLOGIES

- **LANs**
- **Client/Server Architecture**
- **Minicomputers**
- **EDI**
- **Laptops**

EXCLUSIVE

BUDGET/SPENDING SURVEY

NATURAL RESOURCES:

Greasing The System

APPLICATIONS

Efficient communications among the far-flung operations of companies in the oil exploration, mining and forestry industries is the top applications priority for their IS managers. Network administration is the high-profile project at most natural resource companies these days, owing to the strong demand for smooth data interchange among the various local and wide area networks linking production, marketing and transportation departments. Top managers are depending on EIS to more precisely forecast trends.

THE HOT APPLICATIONS

- **Network Administration**
- **Personnel Management**
- **Electronic Mail**
- **EIS**
- **Maintenance**

Because personnel are scarce in this industry, human resource management systems that optimize staff utilization are also high on IS managers' applications lists. "This is a capital-intensive industry with few people," explains an oil company IS chief. HRM systems also track safety-training progress, he adds. ■

SECTOR BENCHMARKS

Mean IS Budget	Mean IS Budget % Change	Non-IS Spending On Technology	Mean Head Count	Head Count % Change
$6.0 ($Millions)	2.1% From 1991	20% (As % Of IS Budget)	37 Average	-1.0% From 1991

TECHNOLOGIES

Supercomputers have been the standard at oil companies for years, but powerful LANs linking reduced instruction set computing (RISC) workstations in a client/server architecture have also become widespread in seismic analysis departments of the major oil companies. "We have as many MIPS in workstations as we do in mainframes and Crays," says the head of MIS at one multinational oil company. More powerful workstations based on parallel processing architectures are needed for computationally intense mapping applications. Database-dependent mapping of potential mineral deposits have required more powerful workstations and relational database management systems designed for client/server computing. And petroleum engineers are demanding more user-friendly interfaces for their UNIX-based machines. ■

THE HOT TECHNOLOGIES

- **Client/Server Architecture**
- **GUIs/Windowing**
- **LANs**
- **RISC Workstations**
- **RDBMSs**

One Last Chance For ISDN

After years of hyperbole and delay, ISDN is back with a much more realistic agenda.

Few communications technologies have been more overhyped or the butt of more jokes than the Integrated Services Digital Network (ISDN). Yet if ISDN supporters realize within the next year their goal of a national standard and reduced prices, ISDN may have the last laugh.

Today's definition of success for ISDN has narrowed in scope from that of just a few years ago. Briefly described, ISDN is a public switched service that allows the digital transport of voice, data and image communications over one network. While that description hasn't changed, few still believe that ISDN will be the only network service of choice or that an incredible crop of new applications will arise just because of its existence.

"The benefits of ISDN are not home run benefits," says David Telleen-Lawton, senior consultant at Frank H. Robinson & Co. Inc., a Santa Barbara, Calif., consulting firm. "ISDN does make things more convenient, but that's a hard sell."

For the leading edge of customers, ISDN has had some quiet successes. It has allowed some users to replace private branch exchanges (PBXs), modems and expensive leased lines. Its usefulness is also being explored for backing up private lines, providing on-demand bandwidth to supplement overused private networks, handling videoconferencing and graphics applications, and for handheld PC communications.

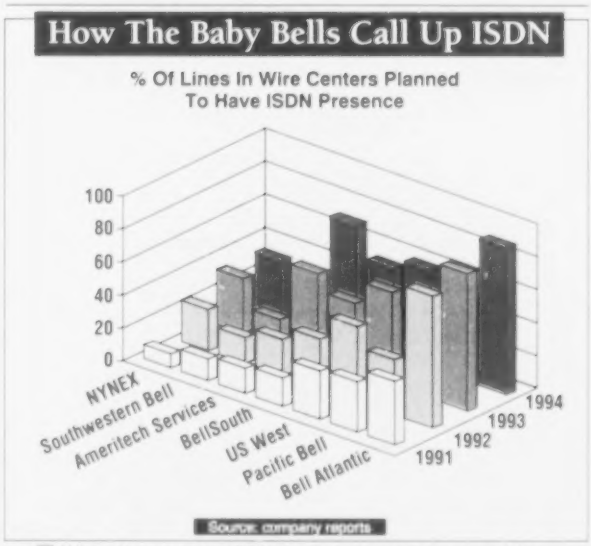
Perhaps the best known ISDN application is automatic number identification, or ANI, which is widely used in customer service operations and telemarketing. ANI displays the caller's phone number even before the phone is picked up. This allows businesses to tie their phone systems into customer databases to speed call processing.

Supporters now say that it is likely there may never be another application as dependent on ISDN as ANI, and the emphasis should be on additional ways ISDN can save users money and time. "To a telecom person, ANI is no big Watusi," comments Lisa Hoesel, senior telecommunications specialist for U.S. Bancorp in Portland, Ore. "What I like about ISDN and other technologies are the bandwidth and network management features."

Indeed, because ISDN offers 64-kilobit-per-second increments, it is far faster than most modems. IBM product marketing manager Virginia Haggerty sums up the difference: sending a 50-page document with a 2,400-baud modem takes approximately eight minutes. Using ISDN, that document is sent in 15 seconds. Likewise, says Brent Bilger, product line manager for router manufacturer Cisco Systems Inc. of Menlo Park, Calif., ISDN sets up data transfers in less than two seconds; a modem can take up to 30 seconds to set up the same call.

According to a July 1991 survey of 200 computer-assisted telephony users conducted by Business Research Group, a subsidiary of Cahners Publishing Co. in Newton, Mass., 7% of respondents currently use ISDN and 56% will potentially use it over the next two years. Most interesting is the discovery that 42% intend to attach local area networks to ISDN. These users won't replace LANs with ISDN. Rather, they'll use ISDN to connect LANs to other devices, such as packet-switched networks, PBXs, workstations and host computers.

Ironically, while ISDN has been tested mainly by large corporations, its true potential may lie in smaller and mid-sized companies that can't afford more expensive alternatives. ISDN has already been replaced in the minds of telecom managers by frame relay and



■ When it comes to ISDN implementation, some of the regional phone suppliers are moving faster than others.

BY SUSAN KERR

switched multimegabit data services. As a way of defining the three, ISDN is more likely to serve lower-speed packet and circuit-switched applications, whereas frame relay is a more expensive alternative for large business networks that need 56Kbps to 1.5 megabit-per-second packet switching. Switched multimegabit data services (SMDS), with speeds of up to 155Mbps, are for the very high end of the spectrum.

Still, setting a realistic price/performance tag for ISDN is next to impossible because of factors such as volume discounting and variable equipment needs.

Although he refuses to provide tangible dollar comparisons, Richard Campbell, ISDN product manager for AT&T in Bedminister, N.J., says that the crossover point between ISDN and alternative line services depends on network traffic, frequency of use and available discounts. In some cases, he says, using the network for only two to three hours a day means that ISDN is more cost effective. Dean Wolf, marketing manager for San Jose-based Fujitsu Network Switching of America Inc., says the average monthly fee for a switched 56Kbps line from the local telephone company ranges from $45 to $200, depending on region. A comparable ISDN service charge begins at approximately $30.

Equipment prices are also becoming more attractive, although they're still high. ISDN terminal adapters cost around $1,500, which is at least twice as much as modems, but customers should see prices continue to drop. And in some cases, if customers move to Centrex-based ISDN, they actually get rid of their PBXs in the process.

In his detailed study of 10 Basic Rate Interface (BRI) customers, consultant Telleen-Lawton discovered that four of them replaced their PBXs after ISDN came aboard. Another customer in the study found that the cost of the PBX equaled that of the ISDN service, but he no longer needed the support structure associated with owning private communications equipment.

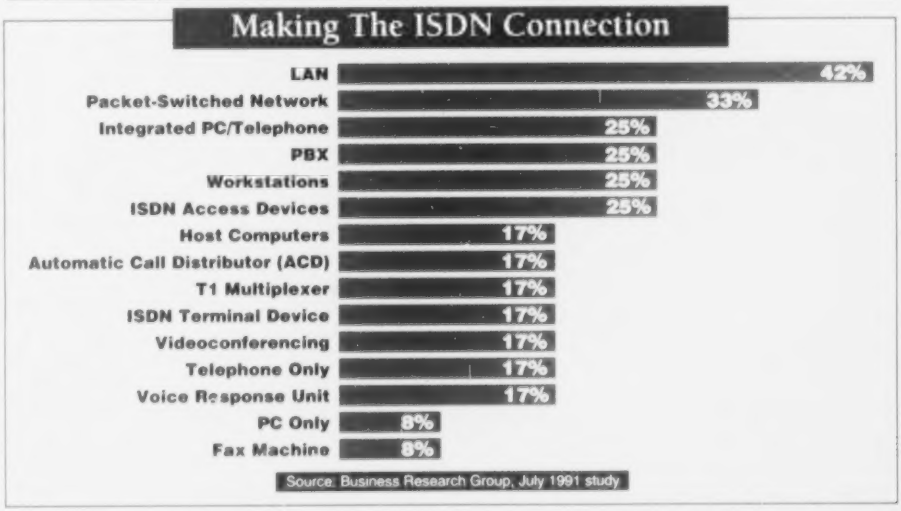
Yet despite these and other potential ISDN selling points, the major problem with ISDN is that there have been so many barriers, both technical and nontechnical, to its use. U.S. Bancorp first started with ISDN four years ago. It is interested in ANI, but is limited to using the technology internally only, because Washington and Oregon have restricted the use of caller identification out of privacy concerns.

U.S. Bancorp has also tested ISDN for automatic teller machine transactions and computer terminal adapters. Despite its success with these trials, U.S. Bancorp is hindered by the market, primarily because not all tariffs have been set for the service in its area. And the problems run deeper than that. Although it has been four years since AT&T became the first long-distance carrier to announce ISDN tariffs, neither interconnectivity among different telephone service providers nor interoperability among various makes of customer premises equipment is here yet. The local telephone carriers particularly have lagged behind—many do not offer ISDN service to a noticeable percentage of their customer areas.

Realizing that they better move now, Bell Communications Research Inc. (Bellcore) and the regional phone companies are spearheading National ISDN-1. NI-1 is a group of technical implementation agreements designed to ensure that a national, standard ISDN infrastructure comes about. Among the issues being addressed are network interface guidelines, applications programming interfaces and compatibility testing.

NI-1 promotes a standard BRI protocol. The next step, known as National ISDN-2, looks toward establishing uniform Primary Rate Interface (PRI) services and will be defined by Bellcore later this year. BRI specifies two bearer (or "B") channels, each operating at 64Kbps, and one signaling ("D"for Delta) 16Kbps channel. PRI specifies 23 B channels and one D channel.

AT&T, Northern Telecom Inc. and Siemens Stromberg-Carlson announced last year that they will modify their switches to conform to the standard, so ISDN users no longer will have to worry if their equipment is compatible with whichever switch is handling calls. One caveat: the regional Bell operating companies are starting to deploy NI-1 this year, but at varying rates. According to Bellcore, last year the percentage of lines in RBOC wire centers with an ISDN presence ranged from 8.3% in NYNEX Corp.'s territory to 37.9% in Bell Atlantic Corp.'s territory. By 1994, the RBOC's say, these numbers will range from 16.3% in Southwestern Bell Telephone Co. terri-



■ **Current users of computer-assisted telephone systems planning to implement ISDN intend to attach these devices to their networks over the next two years.**

tory to Bell Atlantic's 87%.

The key to ISDN is ubiquity, and until that's reached its usefulness is severely limited. "A lot of users want public networks to access remote locations, but the carriers instead have been putting nodes in San Francisco, not in the heart of Oregon," points out Rosemary Cochran, a principal with Vertical Systems Group in Dedham, Mass. "Yet big cities are where customers have a concentration of usage to justify private lines."

Basically, manufacturers and service providers are waiting for the market to swell before putting in a full-hearted ISDN effort. But that rubs some users the wrong way. "I don't give IBM money to build me a new computer. They build it, and then I order it. You need something out there first," says Edward Hodgson, manager of computing and communications for Schindler Elevator Corp. in Morristown, N.J. Nonetheless, Hodgson is a cofounder of the North American ISDN Users Forum and a staunch supporter of the service. "We have a large leased network, and that is a real pain," he says. "We also want to put in a centralized imaging system, but [without ISDN] we couldn't figure out how to access it without going broke."

Schindler currently has 37 field sites tied into the headquarters over leased lines, and Hodgson would like to replace some 56Kbps lines while keeping intact T1 networks. But his real goal is to allow elevator service people to go into the field with portables and use ISDN to call headquarters and retrieve images of the parts being serviced. Modem speeds are too slow for that application, and leased lines couldn't even be considered because they're too costly. Schindler plans to get this ISDN application rolling within the next two years.

To a telecom person, ANI is no big Watusi. ■

Another handheld PC application is in the works at Johns Hopkins Health System in Baltimore. Clerks audit supplies in storerooms with handheld devices whose memory capacity fills very quickly. The clerks used to go back to a central location, where someone else would transfer the data to a mainframe. "With ISDN, we have a fast and error-free way to download data," says Edward Thyberg, manager of network communication systems. "It allowed us to do things that would be cost prohibitive before."

"ISDN isn't going to succeed at the exclusion of everything else," says Tom Hunter, senior planner in IBM's ISDN System Development group based in North Carolina's Research Triangle Park. "If the service is available at points where you need to move data, then it gets down to evaluating the service and cost." His hope—and that of many users—is that evaluation will be more positive this year. ■

New Version 5.1 Also Supports MVS & VM

Remote SpoolPrint 3X/400/370™

PRINTER PASSTHRU To/From S/3X, AS/400, and to S/370

- Automatically transfers spool file entries to remote system(s).
- Totally automatic, transparent to the user.
- Supports multiple printers in each remote system concurrently.
- Retains job name attributes.
- S/38, AS/400: Activates monitor instantly when output arrives.
- Works with display station passthru.
- S/36: Program monitors printer IDs every few seconds.
- Can be started automatically at IPL.
- S/36 does not require the IBM ICF Base Communications feature (FC-6266).
- 30-day FREE trial. Order Today.

Broderick Data Systems

PHONE: 419/589-3836
FAX: 419/589-9409

777 Laver Road
Mansfield, OH. 44905

© Copyright 1992, Broderick Data Systems

Circle 28 on Reader Card

Do it out of respect for the dead.

And the living.

THE AMERICAN HEART ASSOCIATION MEMORIAL PROGRAM

American Heart Association

This space provided as a public service.

How To Avoid The Pitfalls Of Downsizing

Forget the utopian hype. Downsizing from mainframes to workstations is a tough job. But these basic principles can make it work.

By any measure, workstation price/performance not only beats that of the mainframe but is widening its lead.

Why, then, do IS sites move so cautiously into this new world, downsizing in piecemeal fashion only?

One answer is that downsizing requires much more than faith in the superior price/performance of the workstation. Downsizing the wrong application can inflict software conversion costs far greater than the amount saved by a new hardware platform.

There are three important ways to avoid the pitfalls of downsizing and enjoy its rewards:

- Research compatibility issues carefully,
- Handle organizational issues up front,
- Understand the business problem the application is supposed to solve.

Maintaining compatibility is the key determinant in moving applications from the mainframe to the desktop. But ensuring compatibility doesn't mean asking general questions such as: "Do both platforms have a COBOL compiler or a relational DBMS?" True software compatibility means detailed, point-by-point comparison of software features, syntax, semantics and behavior.

To appreciate what may be involved in downsizing an existing mainframe application, consider merely the database portion of that application. On the mainframe, if the application uses DB2, the equivalent IBM product for the desktop is the OS/2 Database Manager. What incompatibilities are there between these two database products that could block a downsizing effort?

Several, actually. IBM's Systems Application Architecture (SAA) Database Reference manual asserts that nearly 100% of the Structured Query Language (SQL) elements it lists are common between DB2 and the Database Manager. But the SQL reference manuals for the two products show that many SQL statements exist in one product and not in the other. Even among SQL statements common to both products, parameters may be unique to one.

The bottom line on SQL compatibility is that the data manipulation language is the same between DB2 and Database Manager; the data definition language is the same for logical objects but different for physical objects; and the Data Control Language is also largely different, since SQL GRANTs and REVOKEs operate on different objects.

How much these incompatibilities affect downsizing of an application depends on how much that application employs the unique features of DB2. Of course, the developer could alter the application to take advantage of features unique to the OS/2 Database Manager or to optimize the application for the downsized architecture. Software designed for mainframe transaction processing, for example, may perform quite differently with a DBMS client/server architecture on a LAN.

Differences between database management systems extend well beyond those of the various SQLs. DBMS internals and operation differ in respect to relational catalogs and directories, storage mapping, security, limits, locking, isolation levels, binding, logging, backup, recovery, referential integrity and utilities. Consider just one category, utility processing. DB2 production utilities must be entirely rewritten to support the same application under the OS/2 Database Manager. Look at the differences between the two products' catalogs: the Database Manager catalog is not a simple subset of that used by DB2; applications directly dependent on the catalog must be altered appropriately or they may abend. Without disparaging these products, their incompatibilities show why

BY HOWARD FOSDICK

downsizing is far from simple.

The downsized application's terminal interface requires the same depth of analysis as its data storage. Mainframe applications typically use the Customer Information Control System (CICS) or IMS/TM transaction monitors, or possibly even the ISPF Dialog Manager, Time-Sharing Option (TSO) or Conversational Monitor System (CMS) services for terminal management. PC applications control screens through Windows, OS/2 Presentation Manager or some other graphical user interface (GUI) generally unavailable on mainframes. In the few cases where full compatibility is possible, the downsized application forgoes the advantages of the workstation user interface. For example, downsizing from mainframe CICS to CICS-OS/2 means compatibility, but it also means application changes if one seeks GUI advantages.

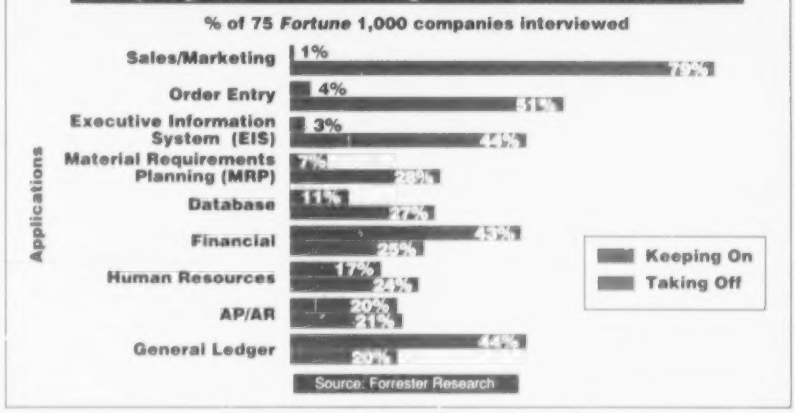
Extend these comparisons of DBMS and terminal software compatibility to application generators, debugging tools, expert system shells, natural-language interfaces, fourth-generation languages, programming languages, computer-aided software engineering tools and their generators, versioning and change-management tools, performance-monitoring and tuning products, and all the other software necessary to applications development, operation and maintenance. Compatibility questions quickly separate existing applications into two groups.

Newer applications, those developed since SAA and the growth of the cross-platform tools market, may be fully compatible. Many current application development environments are designed specifically for cross-platform use. These tools include certain 4GLs, application generators and expert system shells. They make downsizing a low-risk, high-payoff deal.

But many older applications, the very ones that have the most to gain from downsizing, often employ unique, antiquated and therefore incompatible mainframe software. They were written before there was much interest in cross-platform compatibility and well before downsizing, SAA compatibility guidelines or the current generation of cross-platform development tools were conceived. Even with the current generation of sophisticated workstation products able to emulate mainframe software, IS must carefully research compatibility. IBM's recent transformation of its SAA goals from cross-platform software compatibility to cooperative processing underscores the difficulty of creating truly compatible hardware/software platforms.

Organizational realities affect all downsizing approaches. Take training. To the extent that the software environments of the mainframe and downsized platform are compatible, training costs are minimized. Even where software compatibility is not complete, IS professionals may be able to bridge the gap. For example, while minor differences in SQL between the mainframe and downsized platform may be disastrous for program compatibility, programmers can make the transition easily. A

Staying On Or Coming Off The Mainframe?



The Downsizing Culture Clash

Translating mainframe administration standards and practices to a new hardware environment is the great, hidden challenge of downsizing. The cultural transformation that downsizing requires is even more critical than hardware and software issues, yet it remains largely unexamined and unmanaged.

The pitfalls of downsizing software are all too easily illustrated when the organizational culture is not downsized first. The lapses described here demonstrate how far IS has to go. Names of companies have been withheld to protect the negligent from embarrassment.

- One company operates a transactional client/server database application on a local area network, but performs recovery only to the point in time of the last image copy, even though it provides latest-commit-point recovery on its mainframe databases.
- Another company runs mission critical database and analysis applications on workstations without backup procedures.
- A third operates a LAN without informing its users of network changes or reconfiguration of individual workstations. The same company routinely notifies mainframe users of changes via time-sharing option broadcast messages.
- Still another corporate user runs on its workstation network the same kind of versioning and change-management software that is part of its mainframe development environment.
- Other companies lack either manual or automated procedures for software distribution or inventories of the purchased software running on their workstations.

database program that directly uses a relational DBMS catalog may abend when ported to a DBMS with a differing catalog, but for IS professionals the mental transformation between catalogs may be simple.

But what about those areas of total incompatibility? An application that uses CICS on the mainframe and is ported to an OS/2 Presentation Manager environment is an example. Learning PM programming is every bit as difficult as learning CICS programming. IS sites face a major training hurdle in deploying their mainframe programmers on such a conversion project.

Here's a simple formula to apply: the size of the training effort is proportional to the size of the compatibility gap between the mainframe and downsized environments.

Another organizational challenge is identifying the best applications for downsizing. This requires a thorough understanding of the current applications portfolio and business needs of the company. Departmental applications, query applications, those that need to be redesigned for a GUI, those that are being enhanced anyway and those that scale well are often prime downsizing candidates. Applications that rely on the traditional mainframe infrastructure are not good candidates.

Downsizing the wrong application can inflict steep software conversion costs. ■

An application that relies on the mainframe-based operations department to schedule batch jobs and burst and distribute reports within the company might not work well in the same firm's local area network. Perhaps the application's batch philosophy should be altered to that of a dynamic query environment. An application-by-application approach to downsizing is the safest way to proceed, because companies gain experience as they progress.

Many industry analysts promote an appealingly simple, high-level vision of downsizing. The work-a-day reality is this: where IS understands software compatibility and carefully selects applications, and where organizational challenges are addressed first, downsizing existing code presents a tremendous opportunity to do more for the organization at reduced cost. Glossing over compatibility issues and ignoring the implications of downsizing can produce a costly exercise in converting applications that already work, as well as a long, difficult period of what is euphemistically called "organizational adjustment." ■

Howard Fosdick is both industry analyst and hands-on technician. As an independent consultant, he specializes in IS software for mainframes and PC's.

SALES OFFICES

Publisher/Vice President
Mike Wisner
Sales Manager
Stephen Twombly
Sales Services
Kelly Mount
Production Supervisor
Laurie Poth
Production Manager
Dian S. Tobin
Advertising Services
Claudia A. Marinelli

EASTERN REGION

MID-ATLANTIC
Rick Groves
487 Devon Park Drive
Suite 206
Wayne, PA 19087
(215) 293-1212

NEW ENGLAND, CANADA
Alan Bergstein
199 Wells Avenue
Newton, MA 02159
(617) 964-3730

NYC, NY, CT, LI
Kathy A. Murray Powers
103 Eisenhower Parkway
Roseland, NJ 07068
(201) 228-8617

MIDWEST
John Stellwagen
1350 E. Touhy Avenue
Des Plaines, IL 60018
(708) 390-2967

SOUTHEAST
Peter Nicas
6520 Powers Ferry Road
Suite 395
Atlanta, GA 30339
(404) 955-6500

WESTERN REGION

NORTHERN CALIFORNIA
Tina Ferguson
3031 Tisch Way
Suite 100
San Jose, CA 95128
(408) 243-8838

NORTHWEST
Carole Sacino
3031 Tisch Way
Suite 100
San Jose, CA 95128
(408) 243-8838

SOUTHWEST
Terry Buckley
1904 Church Street
Suite A
Costa Mesa, CA 92627
(714) 722-1242

John Sabo
447 Herondo Street
Suite 305
Hermosa Beach, CA 90254
(310) 379-8455

INTERNATIONAL

CAHNERS PUBLISHING COMPANY
27 Paul Street
London EC2A 4JU
England
Tel: 44-71-628-7030
Telex: 914911 CAHNERS G
Fax: 44-71-628-5984
Managing Director—Europe
Tully Giacomazzi

U.K., SCANDINAVIA, BENELUX
Stuart Smith

FRANCE
Laura Whiteman
Cahners Publishing Ltd.
14 Rue Des Parsieres
92600 Asnieres Sur Seine
France
Tel: 33-1-4790-0507
Fax: 33-1-4790-0643

SPAIN
Carlos Perez
Managing Director
Haymarket S.A.
Arbau, 168-170
1. Planta
08036 Barcelona
Tel: 343 238 1742
Fax: 343 237 6688

GERMANY, AUSTRIA
Erhardt Eisenacher
Cahners Publishing Ltd.
Markt 9
D-5300 Bonn
Tel: 49-228-650013
Fax: 49-228-650076

SWITZERLAND
Werner Stahli
Schiebenacker Strasse 14
CH-8245 Feuerthalen
Switzerland
Tel: 41 53 29 2087
Fax: 41 53 29 2034

ISRAEL
Asa Talbar
Talbar Media
PO Box 22917
Tel Aviv 61228
Israel
Tel: 972-332-2716
Fax: 972 22 4 7 403

JAPAN
Kaoru Hara
Dynacc Int'l Inc.
Suite 1003, Sun Palace
Shinjuku
8-12-1 Nishishinjuku
Shinjuku-Ku
Tokyo, 160, Japan
Tel: 81-3-3366-8301

TAIWAN
Parson Lee
Acteam Int'l Marketing Corp.
2 floor, No. 17, Alley 7
Lane 217, Sec. 3
Chung Hsiao E. Road
PO. Box 18-91
Taipei, Taiwan, ROC
Tel: (866) 2-7114833

SINGAPORE
Peter Cheong
Asia Pacific Media House PTE Ltd.
Newline 100 Beach Road
#24-03 Shaw Tower
Singapore 0718

DATAMATION CAREER OPPORTUNITIES

Roberta Renard
National Sales Manager
103 Eisenhower Parkway
Roseland, NJ 07068
(201) 228-8602

Janet O. Penn
Eastern Sales Manager
103 Eisenhower Parkway
Roseland, NJ 07068
(201) 228-8610

Nancy Olbers
Western Sales Manager
238 Highland Street
Portsmouth, NH 03801
(603) 436-7565

Diane Philipbar
Production Assistant
(201) 228-8608
103 Eisenhower Parkway
Roseland, NJ 07068

INFORMATION CARD DECKS

Diane Berger
275 Washington Street
Newton, MA 02158
(617) 558-4355

INSIDE SALES

Judy Benford
275 Washington Street
Newton, MA 02158
(617) 630-3937

CASE Use Is Growing, But In Surprising Ways

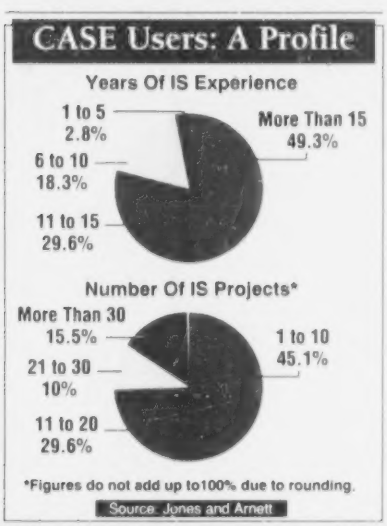
Most mature IS organizations still just use CASE tools to help with administrative dirty work and not for full-blown application design.

BY MARY C. JONES
AND KIRK P. ARNETT

Use of tools for computer-aided software engineering has exploded in the past decade. These tools have improved productivity and reduced the time and resources needed for many types of information systems projects. One of the most frequently cited benefits of CASE is more efficient front-end application development. For example, automated graphics capabilities free analysts to focus on analysis and design rather than on the analysis and design tools themselves. This is thought to be especially true for small-scale projects (see "Reaping CASE Harvests," July 1, 1989, p. 31).

But for large-scale projects, a recent nationwide survey of systems analysts indicates that although CASE is used, it is used differently than expected.

A total of 71 systems analysts responded to the survey. Almost half (49.3%) have worked in IS for more than 15 years; close to half (45.1%) have worked with fewer than 10 projects. All have worked with projects that require at least two person-years to complete.



Responses to this survey indicate that CASE tools are used much more extensively than earlier studies have shown. In this survey, 66.2% of the systems analysts said that they use CASE to some extent; earlier studies indicated that CASE was used in fewer than one-third of the organizations examined (Necco, Charles, "Current Usage of CASE Software," *Journal of Systems Management* [May 1989], p. 6). The use of computerized tools to support the IS design/development process is unquestionably growing.

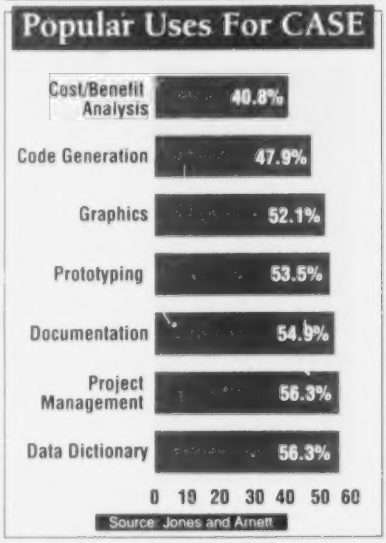
CASE can support all aspects of the IS process, including planning, analysis, design, implementation and support. Specific IS activities addressed in this survey include documentation, graphics (e.g., dataflow diagrams), data dictionaries, project management, prototyping, code generation and cost/benefit analysis.

Virtually every CASE software package on the market provides graphics capabilities; even the least powerful CASE packages can produce dataflow diagrams or entity-relationship diagrams. As a result, one would expect to find that graphics support is the most frequent use for these automation tools. Survey findings show otherwise.

Respondents say they use CASE capabilities most frequently for project management and for data dictionaries; each of those were cited by 56.3% of the respondents. The next most popular use is documentation, cited by 54.9%. Then comes prototyping with 53.5% and then graphics with 52.1%. Just 47.9% of the analysts say they use CASE for code generation, and only 40.8% say they use cost/benefit analysis features in CASE.

At first glance, it seems surprising that so many analysts primarily use CASE for project management. Considering the large scale of these analysts' projects, however, extensive use of this capability is actually quite logical.

Large projects involve many activities and complex relationships. It is necessary to break projects into tasks, track schedules and generate progress reports. Statistical project-management tools such as Program Evaluation and Review Technique (PERT) or Gantt charts have long been used to facilitate completion of these types of projects. If the automation tools used for analysis, design and development also support



project management, they may well come to be used primarily for project management. Such tools may provide an ideal mechanism for managing the development of large IS projects.

Data-dictionary development is often an unwieldy and lengthy process that involves listing and cross-referencing data elements, ensuring consistency among modules, eliminating synonyms and homonyms and ensuring that data are consistently defined and properly used.

Without automation, updating a dictionary to reflect even one change in a system may be very time consuming. Automation lets analysts quickly develop and update the dictionary while preserving the integrity and reliability of data elements.

Documentation support, the third most popular use for CASE tools, is also a cumbersome and inefficient process. Veteran IS professionals sometimes regard it as a necessary pain in the neck. It is often done as an afterthought, after a module of code is written or after two or more modules are put together.

As a result, documentation may contain errors, inconsistencies and ambiguities that are difficult to detect. In large projects it may be difficult to access all current documentation, and it is difficult and time consuming to update documentation to reflect system changes. Using CASE software's documentation features frees the analyst and ensures more accurate and complete documentation.

Prototyping, the next most popular use of CASE, is not as widely used. But 65.45% of the respondents who build prototypes say they use CASE tools to do so. In addition, almost 90% of those who use CASE to support prototyping also indicate that they use one or more fourth-generation languages. This is not surprising, given the popularity of 4GLs for building IS prototypes. This is also consistent with the wide variety of combination CASE/4GL database-management tools available today.

Analysts may design databases, screens and reports with software-engineering workbench tools, yet may never use CASE tools' graphics capabilities. There are two possible causes for the limited use of CASE tools for graphics.

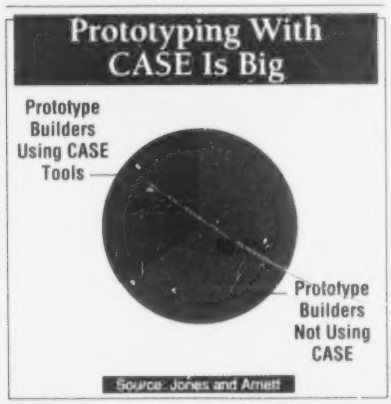
First, most CASE tool packages are oriented toward structured methodologies that represent the activities of a system using dataflow diagrams or entity-relationship diagrams, rather than representing temporal relationships with the more traditional system flowcharts. In this survey, 91.5% of the CASE users said that they use system flowcharts; whereas 87.5% said that they use dataflow diagrams.

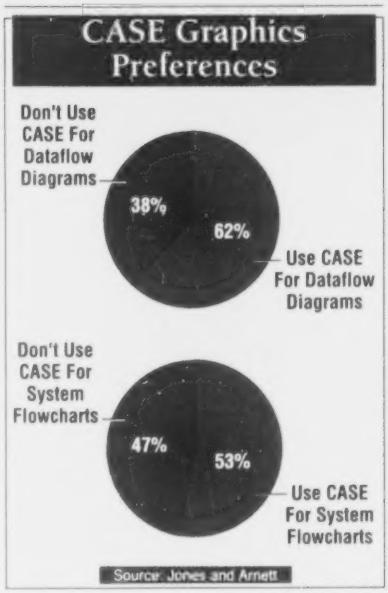
The preference for system flowcharts not supported by most CASE products could affect the use of graphics capabilities. However, 53.15% of the system-flowchart users also said they use the graphics capabilities in CASE, compared with 62.26% of the dataflow diagram users.

The second explanation derives from the heavy time investment required to implement CASE tools. There is no CASE tool standard that allows an organization to purchase a package specific to one or another development approach (e.g., Gane and Sarson, Yourdon, etc.). Thus, those analysts must learn a new design approach as well as the use of a new product.

One study indicates that more than 80% of organizations alter their methodologies as a result of using CASE tools. Analysts may prefer to continue their current methods rather than invest time and energy in using automated graphics capabilities.

It is not surprising that CASE tools are used less for code generation and for cost/benefit analysis than for other activities. Most organizations have standardized approaches and existing packages for performing cost/benefit analysis. Therefore, the use of this feature in a CASE package may be viewed by many in IS shops as unnecessary.


Prototyping With CASE Is Big
Prototype Builders Using CASE Tools
Prototype Builders Not Using CASE
Source: Jones and Arnett



Heavy COBOL use, coupled with the absence of CASE COBOL code-gen - eration capabilities, may help to explain why CASE is not widely used for code generation. The code-generation features available in many CASE packages are primarily oriented toward creating 4GL code. Approximately 80% of the respondents indicate that they are using one or more 4GLs, yet more than 70% of the respondents indicate that they are using COBOL for the majority of their applications. Another explanation is that COBOL code generators have existed for at least 20 years. Therefore, IS shops may have purchased stand-alone generators for COBOL or rejected generators altogether before CASE was available.

CASE is evolving in the workplace, as organizations adopt CASE tools to real-world uses and as users experiment and become more familiar with their features. Vendors may someday fulfill their dreams of a CASE package on every system, but for now most organizations sample a few features from the smorgasbord of CASE options and leave others alone. ■

Mary C. Jones is an assistant professor of management and Miss. Kirk P. Arnett is an associate professor of MIS at Mississippi State University.

It's A Recovery... Er, Sort Of

The DATAMATION Information Systems Performance Indicator (ISPI) began to hoist itself out of its hole this past winter. The indicator rose steadily—from 92.6 in September 1991 to 96.1 in January 1992. Last month the ISPI just nudged the 100 mark; it will most likely head toward 105 by October. But the risks of another decline still exist: the ISPI inched upward at the start of 1991 too, but then faltered as the long economic slowdown turned to recession. Although our forecast for the information technology (IT) industries shows solid growth for this year, the potential for a 1991-style repeat recession exists.

Over the past few months, the computer industry stock price index—one of the series comprising the ISPI—reeled more often than not. But on the upside, and more significant to long-term economic health, new orders received by U.S. IS manufacturers increased. On a seasonally adjusted basis, monthly new orders increased from $8.85 billion in August 1991 to $10.14 billion in January 1992.

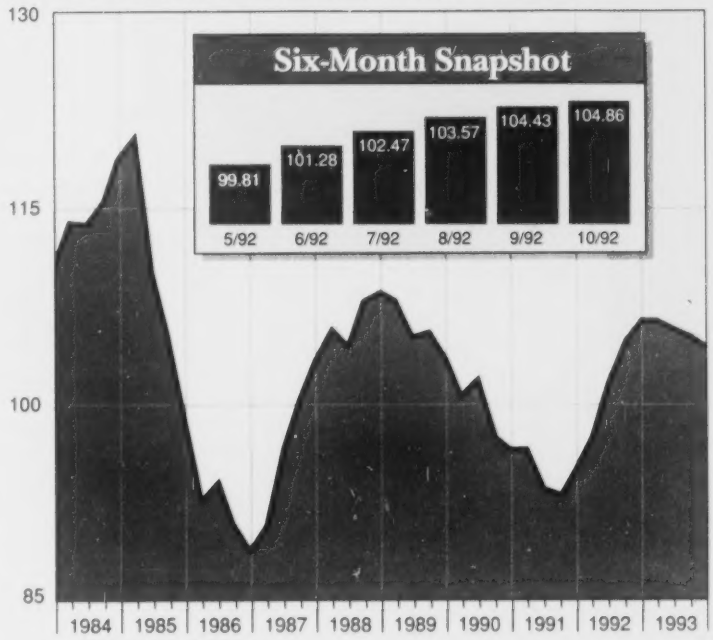
On the downside, order backlogs still dwindled, meaning IT manufacturers' shipments are exceeding orders. At the same time, inventories increased for the first time in January, up by a modest 2%, compared with an annual decline of 4.8% for all of 1991.

Despite all of these conflicting economic signals, U.S. businesses have renewed their purchases of computer, peripheral and communication equipment. The turnaround in domestic investment is the IT industry's best hope for a sustained recovery now. ■

By Madeline Franchi, Cahners Economics. For more information on Cahners Economics's forecasting services call Dan Buchan at (617)-630-2105.

The IS Performance Indicator

If You Truly Believe The Numbers, Recovery For IT Is Already Here



*Shaded area denotes forecast

	Jan. 1992	Dec. 1991	% Change 1/92-12/91	Jan. 1991	% Change 1991/1992
■ Information-Processing Equipment					
Shipments (SA, $ billions)	10.45	9.64	8.3	9.81	6.5
New Orders (SA, $ billions)	10.14	9.67	4.9	9.42	7.6
Unfilled Orders (SA, $ billions)	25.45	25.77	-1.3	28.52	-10.8
Inventory (SA, $ billions)	15.33	15.04	2.0	16.11	-4.8
■ Computer Production Workers					
Employment (NSA, thousands)	252.3	255.0	-1.1	271.0	-6.9
Average Weekly Hours (monthly avg.)	41.4	43.1	-3.9	41.0	1.0
■ Stock Index					
S&P's Computer Systems Stock Price Index	160.6	161.2	-0.3	211.3	-24.0
■ Contracts & Orders					
New Plant & Equipment (SA, $ billions)	32.1	37.6	-14.5	42.3	-24.0

SA= seasonally adjusted;
NSA= not seasonally adjusted

Source: U.S. Commerce Dept.; Standard & Poor's; forecasts: Cahners Economics

Source: Cahners Economics

Headquarters: 275 Washington St., Newton, MA 02158, (617) 964-3030, telex 127703, fax (617) 558-4506. **Central:** Two Forest Plaza, 12201 Merit Dr., #730, Dallas, TX 75251, (214) 419-1820. **Western:** 12233 W. Olympic, Los Angeles, CA 90064, (213) 826-5818; 3031 Tisch Way, Suite 100, San Jose, CA 95128, (408) 243-8838. **International:** 27 Paul St., London EC2A 4JU, England, (44-1) 628-7030, telex 914911. DATAMATION® (ISSN 0011-6963 RP/USA GST #123397457) Magazine is issued twice monthly on the 1st and 15th of every month with additional issues in April, June, September and October by Cahners Publishing Associates, L.P., 275 Washington St., Newton, MA 02158. Editorial and advertising offices: 275 Washington St., Newton, MA 02158. Annual subscription rates: U.S. and possessions, $69; Canada, $98; Japan, Australia, New Zealand, $180 air freight, $290 air mail; Europe $157 air freight, $290 air mail; All other nations, $157 surface, $290 air mail. Reduced rate for U.S. public and school libraries, $47. Single copy, $10 in U.S. **For Foreign Subscribers only:** send all address changes and correspondence to — Datamation, Cahners Publishing Netherlands, Postbus 9000, 2130 DB Hoofddorp, The Netherlands, FAX # ★ 31-20-6531316, Tel # ★ 31-20-6531171. Circulation records are maintained at 44 Cook St., Denver, CO 80206, Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing offices. DATAMATION® copyright 1992 by Cahners Publishing Associates, L.P. Reprints of articles are available; contact Andrea Marwitz (708) 635-8800. Microfilm copies of DATAMATION® may be obtained from University Microfilms, a Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. **POSTMASTER: send address changes to DATAMATION®, PO Box 173377, Denver, CO 80217-3377.**